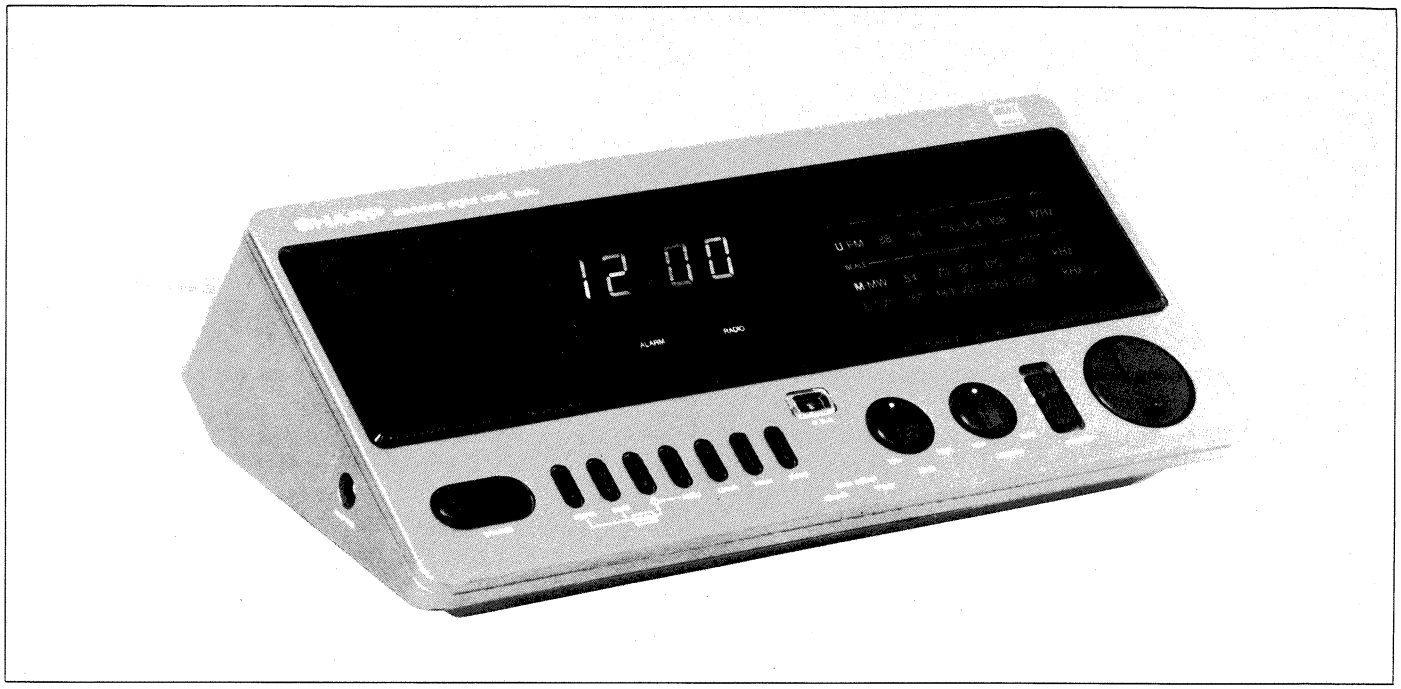
SHARP Service Manual



Solid State LW/MW/FM 3-Band
Electronic Digital Clock Radio

MODEL FY-77CH

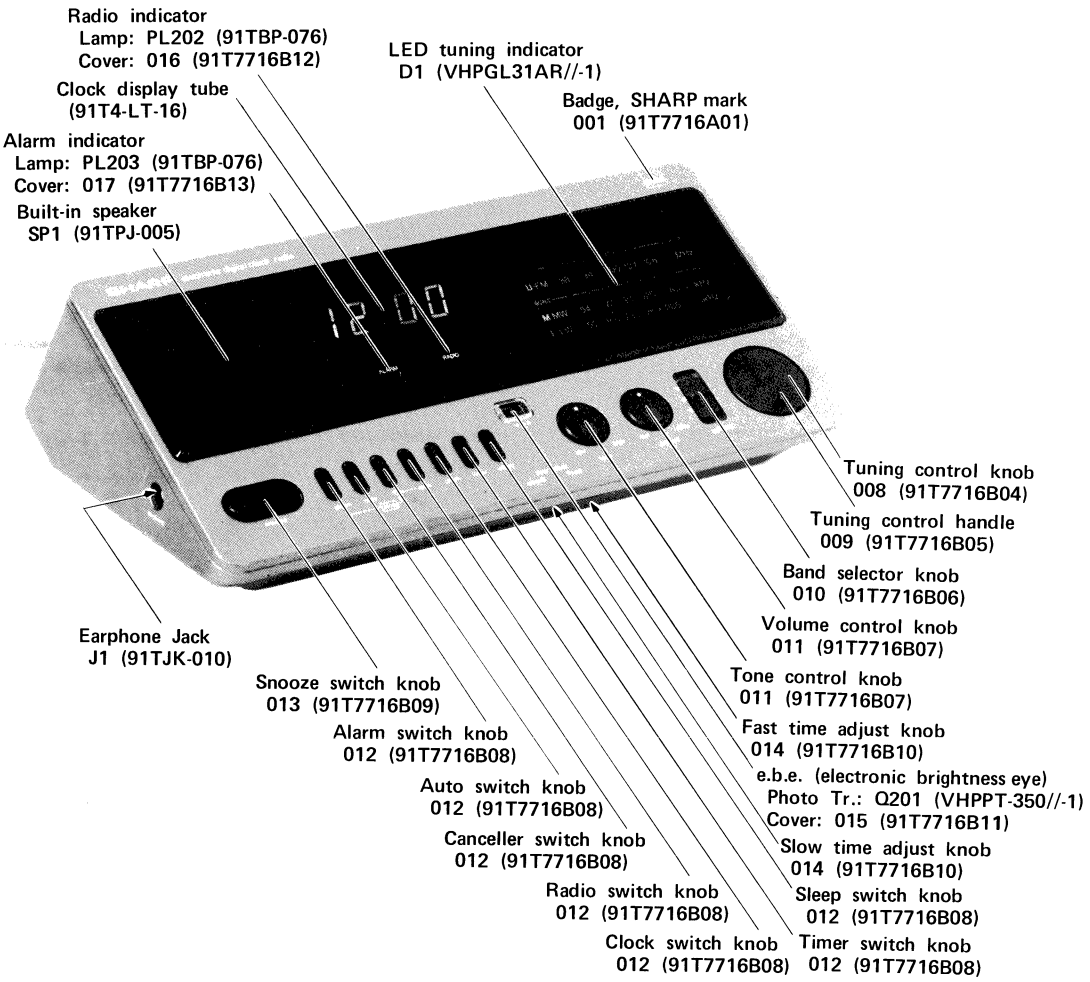
In the interests of user-safety the set should be restored to its original condition and only parts identical to those specified be used.

SPECIFICATIONS

Circuit	LW/MW/FM 3-band superheterodyne system, with AFC (Automatic Frequency Control) and AGC (Automatic Gain Control) circuits, electronic digital clock.
Power Supply	AC 110/220/240V, 50/60Hz
Semiconductors	1-LSI, 1-IC, 27-transistor, 1-photo transistor 32-diode and 1-LED.
Frequency Range	LW: 150 ~ 285kHz MW: 520 ~ 1620kHz FM: 87.6 ~ 108MHz
Intermediate Frequency	LW/MW 455kHz FM 10.7MHz
Power Output	Maximum 800mW Undistorted 500mV
Speaker	8 cm Permanent dynamic speaker, 8 ohms impedance.
Dimensions	Width: 314 mm Height: 98 mm Depth: 172 mm
Weight	1.55 kg

SHARP CORPORATION OSAKA, JAPAN

NAMES OF PARTS



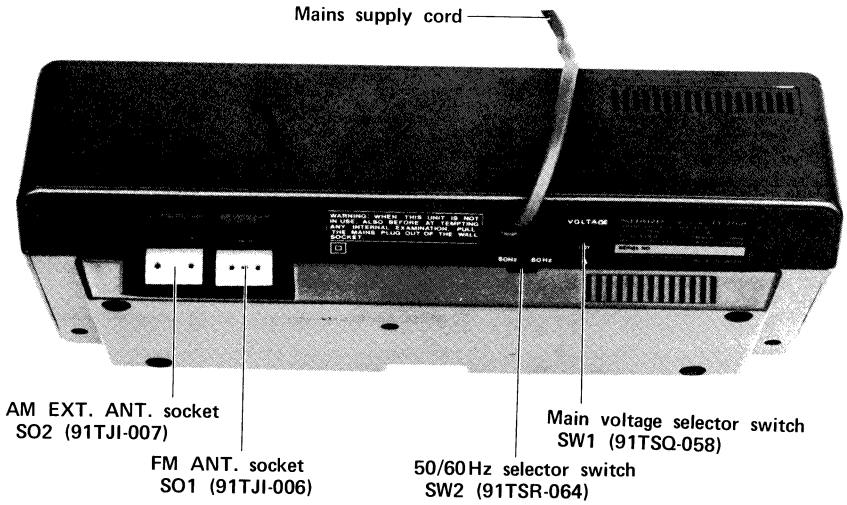


Figure 1

DISASSEMBLY

1. Remove the five screws retaining the bottom cabinet and the EXT. ANT. connector. The bottom cabinet can then be taken out. (Refer to Figure 2).
2. Remove the four knobs (tuning/band selector/volume/tone).
3. Remove the seven screws retaining the chassis, two speaker leads and two e. b. e. leads. It is then allowed to separate the chassis from the top cabinet. (Refer to Figure 3).

Note: In assembling the set, take care so that the soft switch's plate spring, which is attached to the control PWB; won't be caught by the top of the push switch knobs at the cabinet (top and bottom). After that, make certain that the push switches can operate normally.

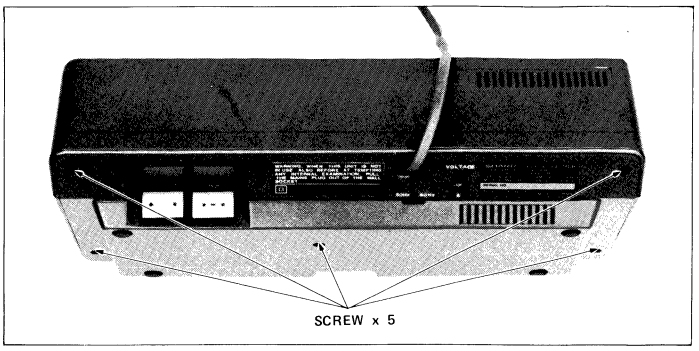


Figure 2

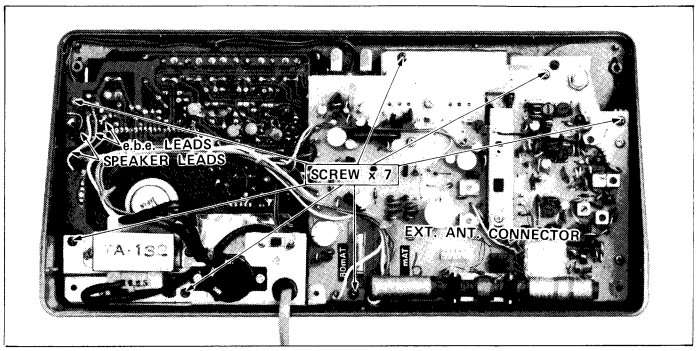


Figure 3

MAIN VOLTAGE SELECTION

When operating the set on AC mains supply, by sure to check the pre-set voltage. If the voltage is different from your local voltage, adjust the voltage as follows: Rotate the plug by using a screwdriver so that your local voltage number can be seen.

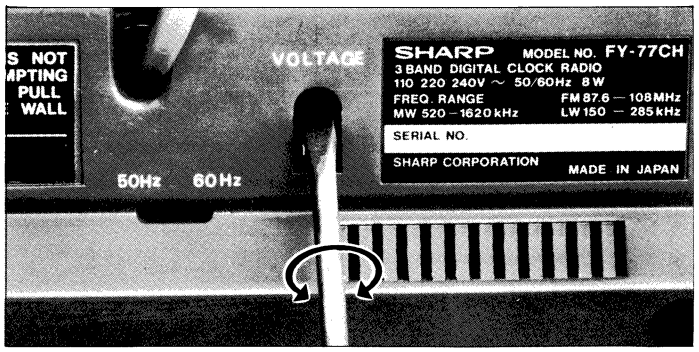

VOLTAGE
SHARP MODEL NO. FY-77CH
3 BAND DIGITAL CLOCK RADIO
110 220 240V ~ 50/60Hz 8W
FREQ. RANGE FM 87.6 — 108MHz
MW 520 — 1620kHz LW 150 — 285kHz
SERIAL NO.
SHARP CORPORATION MADE IN JAPAN
50Hz 60Hz

Figure 4

SYNCHRONOUS FREQUENCY SELECTION

Set the frequency selector switch located at the rear of the set to "50Hz" or "60Hz" according to your local frequency of the mains supply.

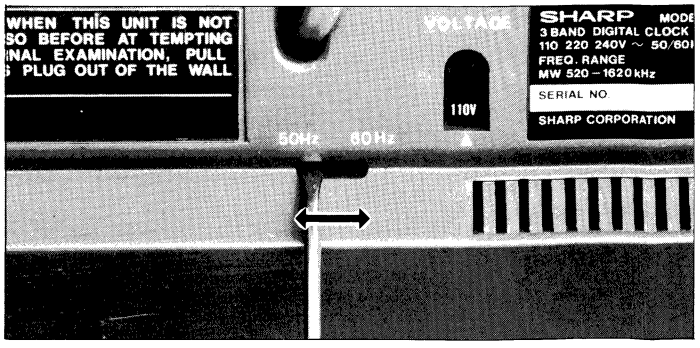


Figure 5

DIAL CORD STRINGING

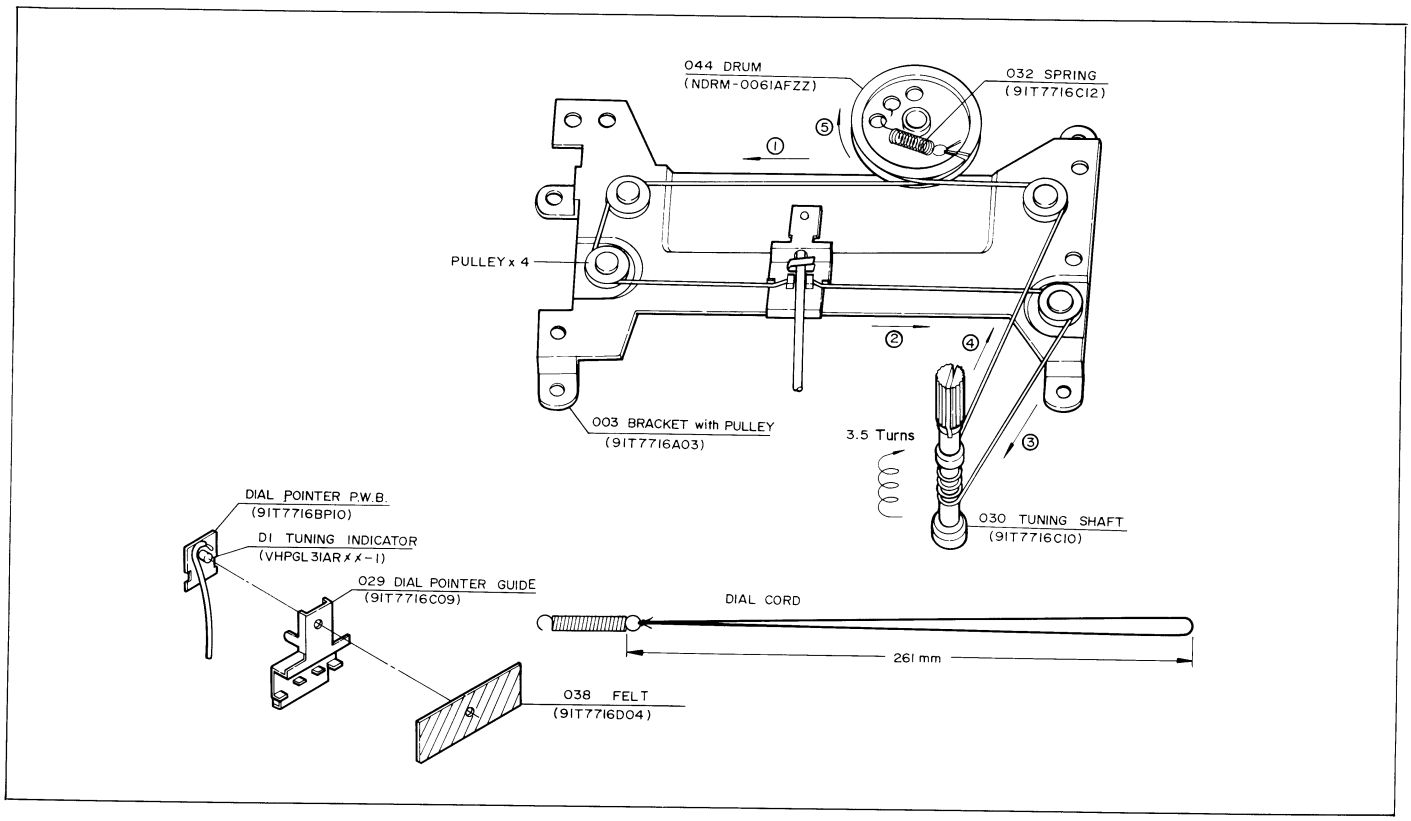


Figure 6

FUNCTIONAL DESCRIPTION OF CLOCK CIRCUIT

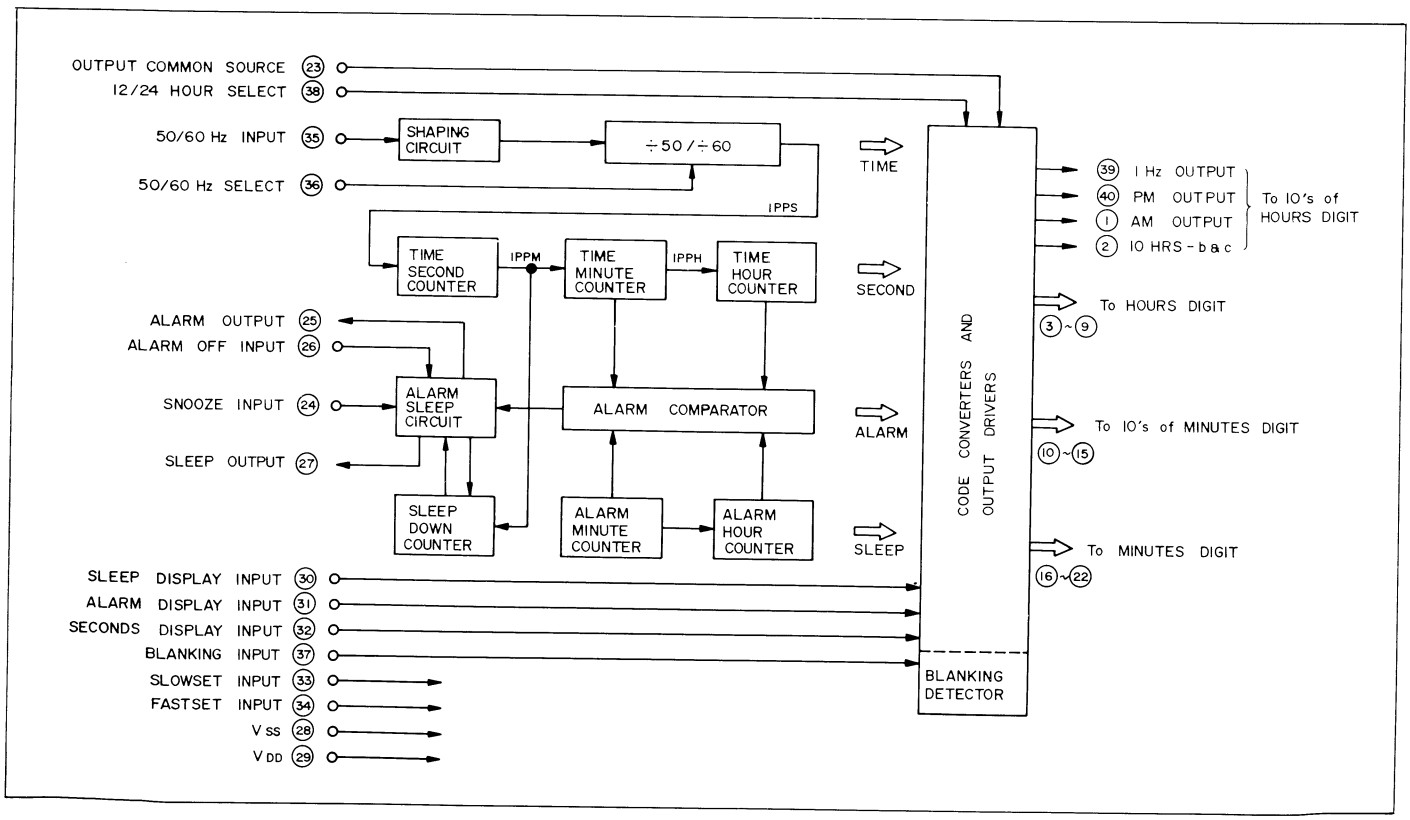


Figure 7 LSI BLOCK DIAGRAM

▪ FUNCTION SWITCH (ON-RADIO / Stand by-AUTO-ARARM)

1. The function switch consists of three flip-flop circuits. When the switch "ON" is pushed, the bases of the transistors Q207, Q210 and Q212 becomes GND potential (0V), the transistors Q207, Q210 and Q212 are turned off while those Q206, Q209 and Q213 are turned on. (In the discussion that follows, Vss level, GND level and flip-flop are represented by high level "1", low level "0" and F/F respectively.)
   In the F/F for "ALARM" mode, the transistor Q206 is turned on while that Q207 goes off so that the collector of the transistor Q207 goes to "0" while that of the transistor Q206, to "1". In the F/F for "Auto" mode, the transistor Q209 is turned on while that Q210 goes off so that the collector of the transistor Q209 becomes "0" while that of the transistor Q210, "1". And in the F/F for the "ON" mode, contrary to those for "ALARM" and "AUTO" modes the transistor Q213 is turned on while that Q212 goes off so that the collector of the transistor Q213 goes to "0" while that of the transistor Q212, to "1". In this case, even if the switch "ON" is released, the F/F can remain as it was. Since the collector of the transistor Q212 is kept to "1", this level permits through the diode D205 and resistors R208 and R155 the transistor Q111 (a requlated power supply) to be turned on. As a result, the transistor Q109 is turned on to supply +B power to the audio circuit, thereby initiating the radio. At the time, the dial lamp (PL201) will light up simultaneously.
2. When the switch "stand by" (⏻) is pushed, in the F/F for the "ON" mode, since "0" level is applied to the base of the transistor Q213, the transistor Q213 is turned off and that Q212 goes on. In the F/F for the "ALARM" and/or "AUTO" mode, the said situation caused when the switch "ON" has been pushed remains as before, however.
   Therefore, since the collector of the transistor Q212 becomes "0", both the transistors Q111 and Q109 are turned off, resulting in that +B power supply to the audio circuit is stopped so that the radio will be turned off.
3. When the switch "AUTO" is depressed, only the F/F for "AUTO" mode is changed from one state to another while those for "ALARM" and "ON" modes remain as they were.
   Accordingly, since the Q209 is kept off so that its collector remains at "1", the transistor Q217 is turned on and the RADIO lamp (PL202) thus lights up. Meanwhile, since the transistor Q210 is kept on so that its collector remains at "0", the transistor Q211 is turned off. At the time, in the case the timer set time is not identical to the clock display time, since the pin 25 output (Alarm Out) of the LSI IC201 is kept at "0", the transistor Q205 is turned off and the collector of the transistor Q211 goes to "0" level, thereby resulting in that the radio is turned off. On the other hand, in the case where the timer set time is similar to the clock display time, since the pin 25 output (Alarm Out) of the LSI IC201 becomes "1", the transistors Q111 and Q109 are both turned on, thereby leading to that the radio is turned on. Simultaneously, the dial lamp (PL201) lights up. After this state has continued for 1 hour (at the sleep count-down mode), the pin 25 output of the LSI IC201 becomes "0" level so that the radio is turned off.

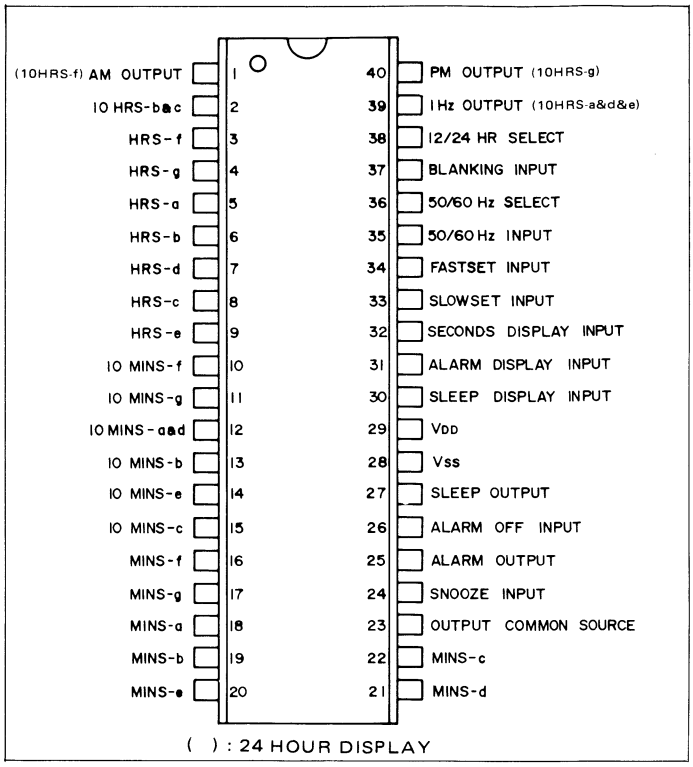


Figure 8 CONNECTION DIAGRAM

4. When the switch "ALARM" is pushed, only the F/F for "ALARM" mode is changed from one state another while those for "AUTO" and "ON" modes remain as before.
   Therefore, since the transistor Q206 is kept off, the transistors Q216 and Q208 are both turned on and the ALARM lamp (PL203) lights up. At the time, in the case where the timer set time is not identical to the clock display time, the pin 25 output of the LSI IC201 is still at "0" and the transistor Q205 is turned off, resulting in that both the transistors Q111 and Q109 are also turned off. On the contrary, in the case the timer set time becomes similar to the clock display time, the pin 25 output of the LSI IC201 goes to "1", the transistor Q205 is turned on and the transistor Q111 and Q109 also do so. At the time, since the emitter of the transistor Q208 is at "1", the transistor Q202 is turned off and so the dial lamp (PL201) doesn't tend to light up. The "1" level of the transistor Q208 emitter is applied to both the emitter of the transistor Q104 at the tuner IF amplifier and the base of the transistor Q105, so that the tuner is turned off (this refers to the muting operation). Concurrently, this permits the oscillator circuit of the transistor Q108 to be energized and its output will then be input to the amplifier IC101 to create alarm sounds. The alarm sound's volume maintains regardless of the set positions of the volume and tone controls. After this state has continued for 1 hour, the pin 25 output of the LSI IC201 becomes "0" and the transistors Q111 and Q109 are turned off so that the alarm sound is stopped--this process is the same as for "AUTO" (Radio) mode.

▪ DISPLAY SELECTOR SWITCH

The display selector switch is composed of the F/F and provided with three positions "Clock", "Timer" and "Sleep".

1. CLOCK DISPLAY

When the clock switch is pushed, since the base of the transistor Q214 becomes "0", the transistor Q214 is turned off while the transistor Q215, on. Even if the switch is released, the F/F retains itself. Accordingly, the collector of the transistor Q215 becomes "0" and the pin 31 (ALARM DISPLAY IN) of the LSI IC201 also becomes "0" the clock gets ready to display the time.

2. TIMER DISPLAY

When the timer switch is pushed, the F/F is changed from one state to another and the transistor Q214 is turned on while that Q215, off. As a result, the collector of the transistor Q215 goes to "1" and the pin 31 (ALARM DISPLAY IN) of the LSI IC201 also goes to "1", the timer gets ready to display the time. To set the timer to desired time requires connection of pin 31 of LSI IC201 to Vss and time adjustment by use of both slow setting and fast setting knobs (Increment is 2 min/sec for slow setting, 60 min/sec for fast setting. If the both knobs are depressed, the display is reset to 00:00). The time predetermined by timer does not change as long as power is supplied. Since the timer display is of five digits the same as for the clock display, the two may be taken for each other--however, only the lower point of the colon present between the hour and minute indication lights up like, for example, 12·00 for the timer display, a difference from the clock display in which the upper and lower points both light up.

If the clock display time and the timer display time become the same the unit starts "Alarm" or "Auto" operation. In this case, it is necessary to push the timer switch in order to again set the timer time--"1" level is thus applied to the pin 26 (ALARM OFF) of LSI IC201 so that "Alarm" or "Auto" operation will be stopped. Note, however, that despite of this, the "Alarm" or "Auto" mode can be alive thanks to the F/F and if this new timer set time becomes again identical to the clock display time, the "Alarm" or "Auto" operation will resume.

3. SLEEP DISPLAY

When the sleep switch is depressed, the pin 30 (SLEEP DISPLAY IN) of LSI IC201 goes to "1" level so as to provide the sleep display mode. This mode is, however, continued only for a duration where the switch is being pushed.

At this time, however, the displayed sleep time remains "00" minutes, providing no sleep operation. To provide sleep operation, it is required to connect slow setting input (pin 33) or fast setting input (pin 34) of LSI IC201 to Vss, and to vary a number on display panel (display tube) in such way as 59, 58, 57 (increment is 2 min/sec for slow setting, and 60 min/sec for fast setting), in order to set sleep time between 59 and 00. Therefore, this clock is designed so as to allow sleep display input (pin 30) (time setting) and slow setting input of LSI IC201 to be simultaneously connected to Vss by operation of sleep display switch. Accordingly, depression of sleep display switch allows sleep time (set time) to appear on display tube in such way as 59, 58, 57--, and thus provides sleep operation. As long as the sleep display is at "59" down to "01", the pin 27 of LSI IC201 remains at "1" level and this level is applied through the resistors R208 and R155 to the base of the transistor Q111 so that the transistors Q111 and Q109 are turned on. As a result, the radio can begin to operate, that is, the sleep operation has been done. To stabilize the voltage to be applied to radio section, zener diode D113 is connected with the collector of transistor Q111. Diode D203 serves to prevent the application of voltage to the base of transistor Q108 for alarm oscillation.

Sleep time can be set within a maximum of 60 minutes as down counter of 60 minutes capacity is incorporated in LSI IC201. Accordingly, output voltage at pin 27 of LSI IC201 reaches 0V as soon as predetermined sleep time is over. This causes transistor Q111 and thus Q109 to be turned off, and thereby stops the operation of radio.

Connecting snooze input (pin 24) of LSI IC201 to Vss during sleep operation puts the clock into sleep off mode, and thus permits output voltage at pin 27 of LSI to reach 0V, causing radio to be turned off. To put the clock into sleep operation again, it is required to depress sleep display switch and to set sleep time as desired.

▪ 50 or 60Hz SELECTOR SWITCH

Frequency selector switch selects either 50 or 60Hz depending on whether pin ㊱ of LSI is connected to Vss or not. That is to say, if the pin ㊱ is connected to Vss, the selector operates as 50Hz frequency dividing circuit, permitting a clock pulse to be generated per 50Hz, and if not , it operates as 60Hz frequency dividing circuit, permitting a clock pulse to be generated per 60Hz.

▪ 12 or 24 HOUR SELECTOR

12 or 24 hour selector selects either 12-hour or 24-hour display format depending on whether pin ㊳ of LSI is connected to Vss or not. If the pin ㊳ is connected to Vss, 24-hour display format is selected and if not, 12-hour display format is selected.

24-hour cycle is available with this unit.

▪ SLOW AND FAST SETTING INPUTS

Time adjustment is performed by the aid of slow setting input (pin 33 of LSI) and fast setting input (pin 34 of LSI). If there two inputs are connected to Vss, a pulse under frequency division is applied as a clock pulse. Time varies in 2 min/sec increments with slow setting input connected, and in 60 min/sec increments with fast setting input connected. If the both inputs are connected, however, time is reset in time display mode, and varies in 60 min/sec increments in clock and sleep display modes.

▪ SNOOZE SWITCH

If snooze input (pin 24) of LSI is connected to Vss during sleep operation the clock is put into sleep off mode, and output voltage at sleep output (pin 27) reaches 0V. On the other hand, if the snooze input (pin 24) is connected to Vss during timer operation (alarm or auto operation), timer operation is interrupted once, and then started again 8 to 9 minutes after the interruption. Such operation is repeated within a hour.

■ **Vss VOLTAGE**

This voltage is +B supply voltage to be applied to LSI, and its maximum rating is +29V. Therefore, Vss voltage for this clock is set to +24V by using zener diode D112. If the voltage reaches less than 20V, it is regarded as power failure though LSI operates, and accordingly, the most significant digit (10's of hours) on display panel (tube) flashes every second. Therefore, it is required to set the Vss voltage to 20 (min.) to 29V (max.).

■ **POWER FAILURE INDICATION**

If Vss voltage reaches less than 20V (or power is interrupted), the most significant digit (10's of hours) on display panel (display tube) flash to show power failure. The flashing can be interrupted by connecting slow or fast setting inputs to Vss after Vss voltage is increased to 20V or more. If Vss voltage is reduced to 0V to discharge C203 completely, the Vss voltage applied again is applied to sleep display input (pin 30) of LSI until C203 is recharged, thereby putting the clock in the same conditions as those which are resulted from turning on of display sleep switch.

Therefore, when power supply is restored after power failure for more than 4 to 5 seconds, radio starts to operate, resulting in power failure indication. To turn off the radio at this time is accomplished by setting snooze switch to ON (Refer to paragraph "Snooze".).

■ **DISPLAY ELEMENTS**

A piece of display tube has display capacity of 4 digits (5 digits including colon), and numeral displays (4 digits) consist of seven segments, respectively.

The display tube can be illuminated by applying a voltage of A.C. 3V (50 mA) to filament, and a voltage of D.C. +20V to grid and plate with filament voltage (Figure 10).

Electrons generated in filament are accelerated by a voltage applied to the plate through the grid to be plunged into the plate (segment) which is coated with phosphor, causing illumination of the plate.

A voltage to be applied to segment unnecessary to illuminate must be lower by 2V (minimum) compared with filament voltage (D.C. voltage component) so that electrons generated in filament do not plunge into the plate (segment) due to reversely biased voltage (Figure 11).

■ **ELECTRONIC BRIGHTNESS EYE (e. b. e.)**

The e. b. e. is, including photo transistor, to control the display brightness according to the lighting intensity of a place where the unit is positioned--the brighter the place is, the more intensive the display and vice versa. The pin 23 of LSI IC201 is a common source to the segment drive FET for the display tube and to vary its voltage can change the display intensity.

Now supposed that the unit is positioned in a darker place, less light enters the photo transistor Q201 to produce no collector current. Therefore, the transistor Q203 is turned off and since Vss is applied through the resistor R211 (10 K ohm) to the pin 23 of the LSI IC201, the display becomes darker.

On the other hand, when the unit is at a brighter place, more light is applied to the photo transistor Q201 to have a current run in its collector so that the transistor Q203 will be turned on. Accordingly, Vss is applied directly to the pin 23 of LSI IC201, resulting in a brighter display.

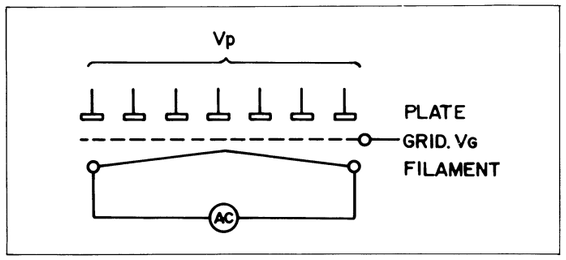


Figure 9 EQUIVALENT CIRCUIT DIAGRAM

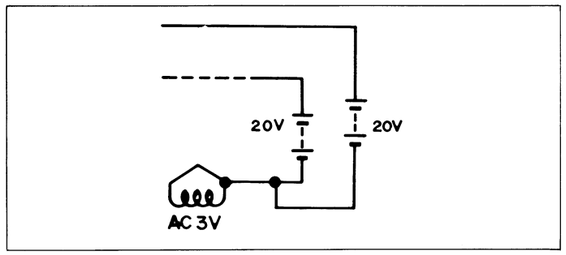


Figure 10

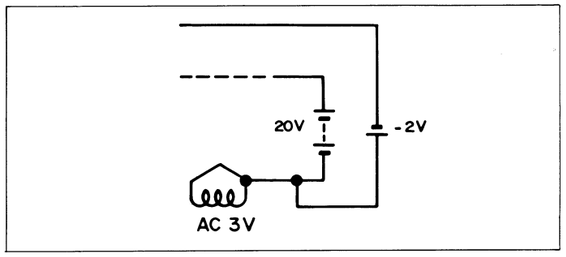


Figure 11

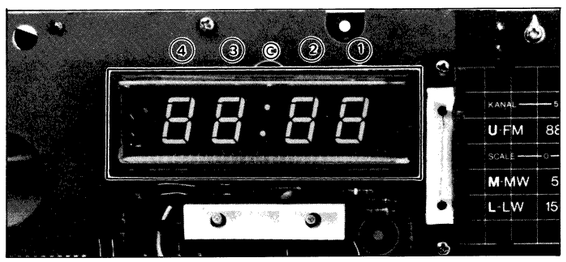


Figure 12

CAUTIONS ON HANDLING MOS LSI

MOS IC is to control the electric conductivity between the source and drain by using the voltage at the gate electrode through insulating oxide film (SiO_2). If overvoltage is applied to the gate electrode, the insulator at the gate electrode undergoes dielectric breakdown. Once such dielectric breakdown occurs, the junction between the gate and other terminals is shortcircuited and MOS IC is so damaged that its quality will not be recovered again.

And, MOS IC is highly sensitive to static charge because its gate oxide film is as thin as 1000A° to 1500A°. Input protective circuit is provided to protect MOS IC but this circuit can not always play its role according to the conditions of using MOS IC.

Therefore, pay due attention to the following when handling it.

■ **CAUTIONS ON TRANSPORTATION AND PRESERVATION**

As for MOS IC, either the input or output terminal has remarkably high impedance in comparison with ordinary semiconductor IC. Therefore, MOS IC is liable to be affected by the induction of neary-by high-tension power source or A.C. power source and it may be given a larger voltage unexpectedly due to body discharged possibly causing dielectric breakdown of the gate. To eliminate this, during transportation and preservation of MOS IC all the terminals should be kept at the same potential in the following methods (to shortcircuit all the terminals).

① Wind thin wire around MOS IC.
② Fit metallic ring on it.
③ Pack it with aluminum foil.
④ Hold it by electric conductive jig.
⑤ Put it in a special case for LSI.

Note: Never put MOS IC in a mal-conductive container such as made of polystyrene.

■ **CAUTIONS ON SERVICING**

① A soldering tool to be used should be the less-leak one (more than 100 Kohm of leak resistance—there may be a soldering tool of more than 1 Meg.ohm to be used for semiconductor). Otherwise, ground the soldering tool when using it.
② Ground the earth terminal of a measuring instrument.
③ Ground a bench.
④ Before insertion or removal of LSI to or from P.W.B., be sure to turn off the power switch.
⑤ When inserting LSI to P.W.B., ground the earth terminal of P.W.B.
⑥ Never touch the terminals of LSI by hand.
⑦ Be sure to ground the earth terminal of D.C. power source.
⑧ To prevent LSI from being broken due to human body discharge, it is necessary to ground the human body. But this requires the greatest care as otherwise the body encounters large current (absolutely avoid touching A.C. power source).

GENERAL ALIGNMENT INSTRUCTION

Should it become necessary at any time to check the alignment of this receiver, proceed as follows;

1) Connect an output meter across the speaker voice coil lugs.
2) Set the volume control to maximum.
3) Attenuate the signals from the generator enough to swing the most sensitive range of the output meter.
4) Use a non-metallic alignment tool.
5) Repeat adjustments to insure good results.

THE INSTRUCTION OF FREQUENCY ADJUSTMENT

In order to comply with FTZ rule: Nr. 358/1970, please fix the low end of dial frequency (87.5MHz) and the high end of dial frequency (108MHz) on FM band, by adjusting oscillation coil (L104-A, B) and oscillation trimmer (TC102), respectively, as illustrated in Figure 13.

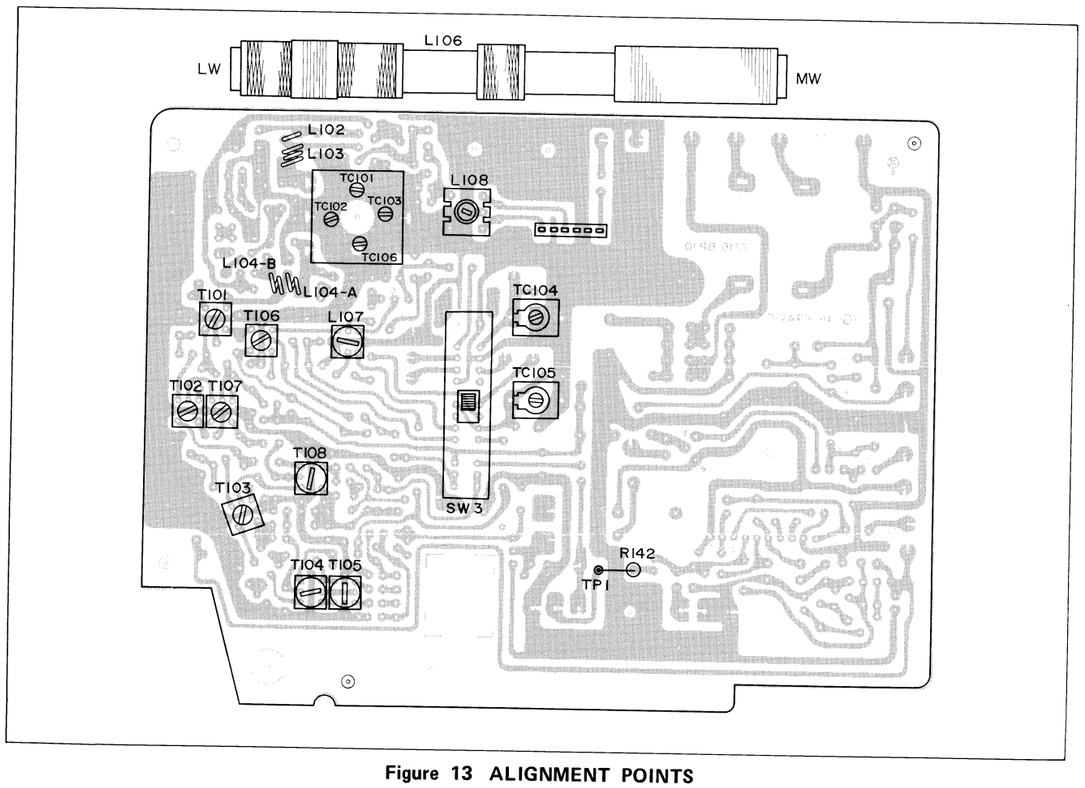


Figure 13 ALIGNMENT POINTS

AM IF ALIGNMENT CHART (LW, MW)

STEP	TEST STAGE	SIGNAL GENERATOR		RECEIVER		ADJUSTMENT
		CONNECTION TO RECEIVER	INPUT SIGNAL FREQUENCY	DIAL SETTING	REMARKS	
1	IF	Connect signal generator through a 10K ohm resistor to the antenna tuning capacitor. Ground lead to the receiver chassis.	Exactly 455kHz. (400Hz, 30%, AM modulated)	High end of dial. (minimum capacity)	Adjust for maximum output on speaker voice coil lugs.	T106 T107 T108

AM RF ALIGNMENT CHART

STEP	BAND	TEST STAGE	SIGNAL GENERATOR		RECEIVER		ADJUSTMENT
			CONNECTION TO RECEIVER	INPUT SIGNAL FREQUENCY	DIAL SETTING	REMARKS	
1	MW	Band Coverage	Use radiating loop. Loop of several turns of wire, or place generator lead close to receiver for adequate signal pickup. Connect generator output to one end of this wire.	Exactly 510kHz. (400Hz, 30%, AM modulated)	Low end of dial. (maximum capacity)	Adjust for maximum output on speaker voice coil lugs.	Adjust the MW oscillation coil (L107).
2	MW	Band Coverage	Same as step 1.	Exactly 1650kHz. (400Hz, 30%, AM modulated)	High end of dial. (minimum capacity)	Same as step 1.	Adjust the MW oscillation trimmer (TC106).
3	MW	Tracking	Same as step 1.	Exactly 600kHz. (400Hz, 30%, AM modulated)	600kHz.	Same as step 1.	Adjust the MW antenna coil (L106). (See NOTE A)
4	MW	Tracking	Same as step 1.	Exactly 1400kHz. (400Hz, 30%, AM modulated)	1400kHz.	Same as step 1.	Adjust the MW antenna trimmer (TC103) (See NOTE A)
5	MW	Repeat steps 1, 2, 3 and 4 until no further improvement can be made.					
6	LW	Band Coverage	Same as step 1.	Exactly 295kHz. (400Hz, 30%, AM modulated)	High end of dial. (minimum capacity)	Same as step 1.	Adjust the LW oscillation trimmer (TC105).
7	LW	Tracking	Same as step 1.	Exactly 160kHz. (400Hz, 30%, AM modulated)	160kHz.	Same as step 1.	Adjust the LW antenna coil (L106). (See NOTE A)
8	LW	Tracking	Same as step 1.	Exactly 260kHz. (400Hz, 30%, AM modulated)	260kHz.	Same as step 1.	Adjust the LW antenna trimmer (TC104). (See NOTE A)
9	LW	Repeat steps 6, 7 and 8 until no further improvement can be made.					

NOTE A

Check the alignment of the receiver antenna coil by bringing a piece of ferrite (such as a coil slug) near the antenna loop stick, then a piece of brass. If ferrite increases output, loop requires more inductance. If brass increases output, loop requires less inductance. Change loop inductance by sliding the bobbin toward the center of ferrite core to increase inductance, or away to decrease inductance.

FM ALIGNMENT CHART

Set the Band Selector switch at "FM" position.

STEP	TEST STAGE	SIGNAL GENERATOR		RECEIVER		ADJUSTMENT
		CONNECTION TO RECEIVER	INPUT SIGNAL FREQUENCY	DIAL SETTING	REMARKS	
1	IF	Connect sweep generator to FM antenna socket.	Exactly 10.7MHz. (400Hz, 30%, AM modulated)	High end of dial. (minimum capacity)	Connect VTVM between test point TP1 and chassis ground.	Detune T105. Tune T101, T102, T103 and T104 for maximum indication.
2	Ratio Detector	Same as step 1.	Exactly 10.7MHz. (unmodulated)	Same as step 1.	See NOTE B.	See NOTE B.
3	Band Coverage	Connect signal generator through a dummy, including output impedance of signal generator to the FM antenna. (Refer to Figure 14) Ground lead of generator connected to the receiver chassis.	Exactly 87MHz. (400Hz, 30%, FM modulated)	Low end of dial. (maximum capacity)	Adjust for maximum output on speaker voice coil lugs.	Adjust the FM oscillation coil (L104-A, L104-B).
4	Band Coverage	Same as step 3.	Exactly 109MHz. (400Hz, 30%, FM modulated)	High end of dial. (minimum capacity)	Same as step 3.	Adjust the FM oscillation trimmer. (TC102)
5	Tracking	Same as step 3.	Exactly 88MHz. (400Hz, 30%, FM modulated)	88MHz.	Same as step 3.	Adjust the FM RF coil (L102, L103).
6	Tracking	Same as step 3.	Exactly 108MHz. (400Hz, 30%, FM modulated)	108MHz.	Same as step 3.	Adjust the FM RF trimmer (TC101).
7	FM ANT. coil (L108)	Same as step 3.	Exactly 88MHz. (400Hz, 30%, FM modulated)	88MHz.	Same as step 3.	Adjust the FM ANT. coil (L108). (Refer to Figure 15)
8	Repeat steps 3, 4, 5, 6 and 7 until no further improvement can be made.					

NOTE B

1) Connect VTVM (0.1 volts range DC scale) between test point TP1 and chassis ground.
2) Adjust T105 for 0 volts.
3) Change signal generator frequency 10.7MHz + 100kHz and −100kHz approximately.
4) Adjust T104 for balanced peaks. Peak separation should be approximately 200kHz.

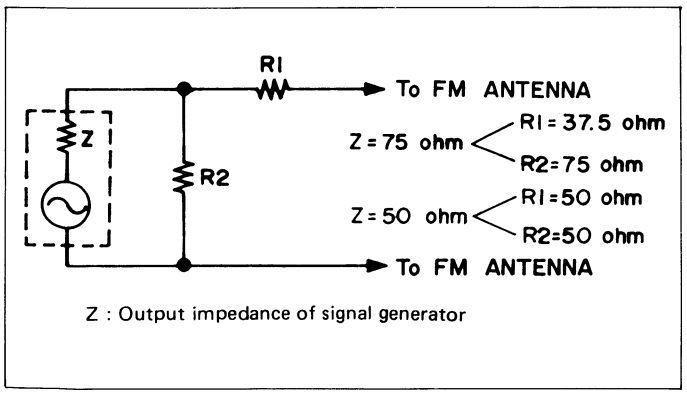


Figure 14 FM DUMMY

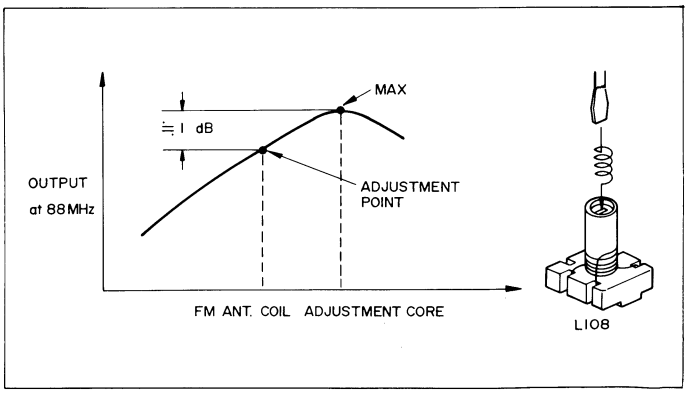
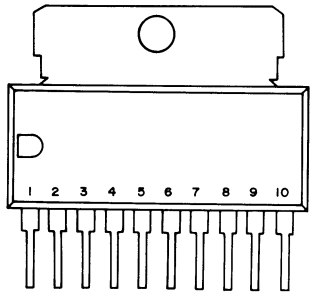
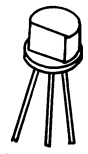


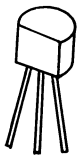
Figure 15 FM ANT. COIL (L108) ADJUST

TA7207 IC101



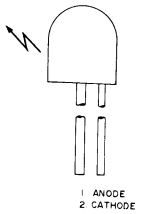


2SA495Y Q204
2SA562Y Q202
2SC380O Q103 ~ 105
2SC735O Q110
2SC784O Q101
2SC785O Q102

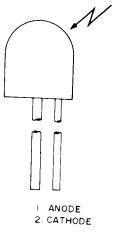


2SC1815GR Q107
2SC1815O Q108, 111
2SC1815Y Q106
Q203
Q205 ~ 217

VHPGL31AR//-1 D1

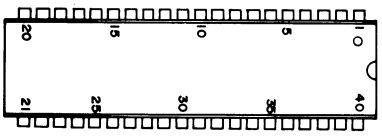


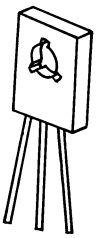
PT350 Q201



1. EMITTER
2. COLLECTOR

PH-IX1016AFZZ IC201





2SC496Y Q109

RADIO P.W. Board				
	Emitter	Collector	Base	Mode
Q101	0.5V	5.9V	1.25V	FM
Q102	0.7V	5.85V	1.46V	
Q103	0.5V	4.8V	1.16V	
Q104	0.6V	5.7V	1.3V	
Q105	0.95V	4.2V	1.6V	
Q106	1.0V	5.9V	1.55V	AM
Q107	0V	4.8V	0.4V *1 0.7V	AM/FM
Q108	0V	4.2V	0.59V	Alarm
Q109	7V *2 0.9V	8.5V *2 0.9V	7.6V	Radio ON
Q110	24V	27V	24.8V	Display
Q111	7.6V	7.7V	8.3V	Radio ON

IC101		Terminal		
1 Pin	7.0V	P102	20V *2 0.3V	Radio ON
2	6.7V	P103	24V	
3	6.3V	P104	0V	
4	3.2V	P105	7V *2 0.9V	
5	3.4V	P106	7.8V *2 6.3V	
6	3.3V	P107	10V	Alarm
7	0.77V	P109	6.4V *2 0.9V	Radio ON
8	3.3V	P110	4.8V	
9	0V	P115	8.3V	AC
10	3.3V	P116		
Remarks: *1: At tuning *2: At radio OFF		P117	27V	AC
		P118		
		P214	2.75V	AC
		P215		

CLOCK P.W. Board						
	Emitter	Collector	Base	Emitter	Collector	Base
	e. b. e.			---		
Q201	0-0.6V	24V	---	---	---	---
	Radio: ON			Radio: OFF		
Q202	6.9V	6.7V	7.0V	0.9V	1.0V	0.3V
	---			---		
Q203	23-15V	24V	0-0.6V	---	---	---
	Timer display			Clock display		
Q204	24V	0V	22V	24V	24V	0V
	Alarm out 25 Pin: ON			Alarm out 25 Pin: OFF		
Q205	24V	24V	22V	0V	24V	0V
	Alarm SW: ON			Alarm SW: OFF		
Q206	0V	24V	0V	0V	0V	0.7V
Q207	0V	0V	0.7V	0V	24V	0V
Q216	0V	0.2V	0.8V	0V	5.4V	0V
	Auto SW: ON			Auto SW: OFF		
Q209	0V	24V	0V	0V	0V	0.7V
Q210	0V	0V	0.7V	0V	24V	0V
Q217	0V	0.2V	0.8V	0V	5.4V	0V
	Radio SW: ON			Radio SW: OFF		
Q212	0V	24V	0V	0V	0V	0.7V
Q213	0V	0V	0.7V	0V	24V	0V
	Clock SW: ON			Timer SW: OFF		
Q214	0V	24V	0V	0V	0V	0.7V
Q215	0V	0V	0.7V	0V	24V	0V
	Q205: ON/Q206: OFF			Others		
Q208	24V	24V	22V	0V	24/0V	0V
	Q205: ON/Q210: OFF			Others		
Q211	0V	0V	0.7V	0V	0/24V	0V

Figure 16

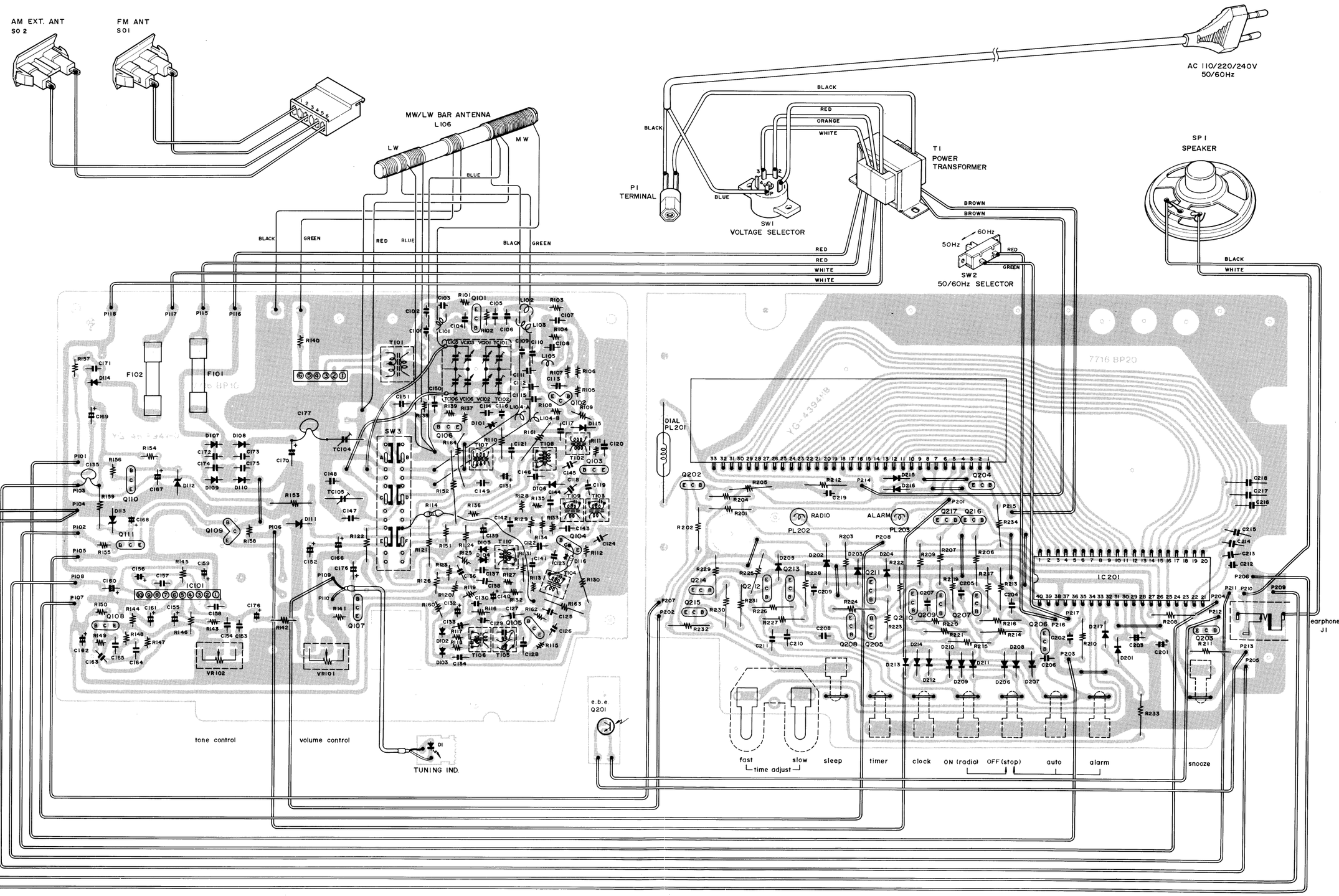
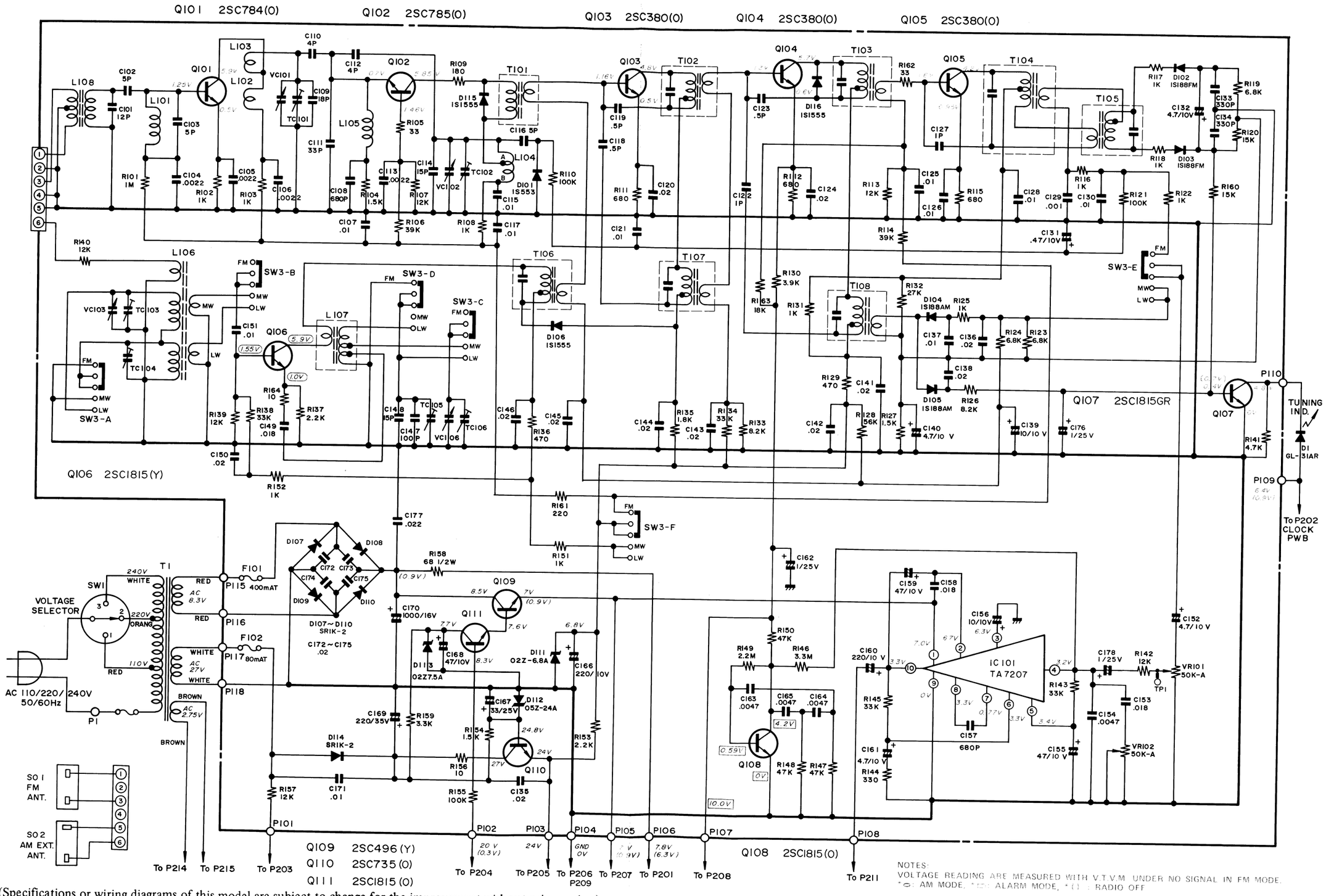
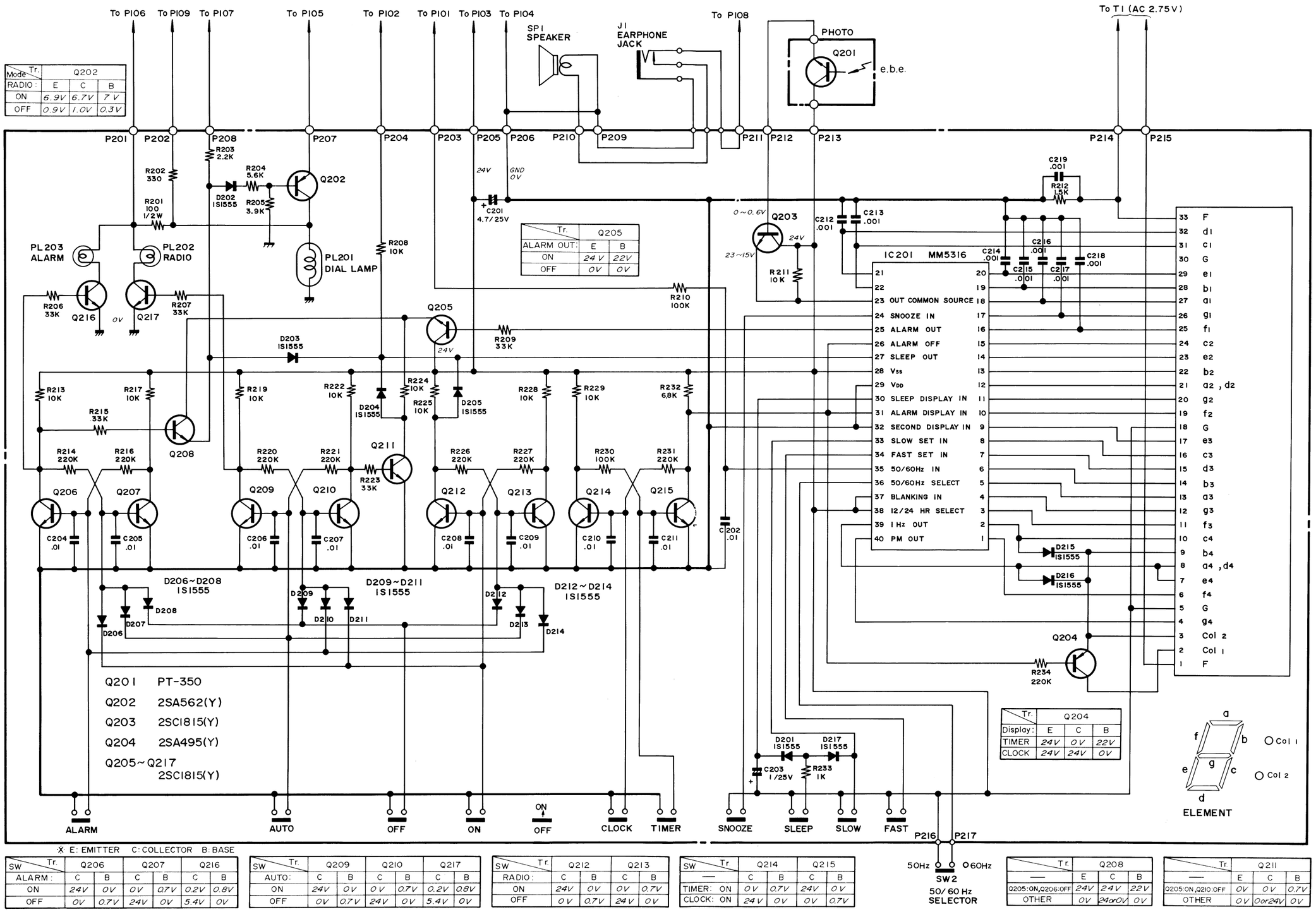


Figure 17 WIRING SIDE OF P.W. BOARD



(Specifications or wiring diagrams of this model are subject to change for the improvement without prior notice.)

Figure 18 SCHEMATIC DIAGRAM (RADIO SECTION)



Mode \ Tr.	Q202		
RADIO :	E	C	B
ON	6.9V	6.7V	7V
OFF	0.9V	1.0V	0.3V

Tr. \	Q205	
ALARM OUT:	E	B
ON	24V	22V
OFF	0V	0V

Tr. \	Q204		
Display:	E	C	B
TIMER	24V	0V	22V
CLOCK	24V	24V	0V

※ E: EMITTER C: COLLECTOR B: BASE

SW \ Tr.	Q206		Q207		Q216	
ALARM :	C	B	C	B	C	B
ON	24V	0V	0V	0.7V	0.2V	0.8V
OFF	0V	0.7V	24V	0V	5.4V	0V

SW \ Tr.	Q209		Q210		Q217	
AUTO:	C	B	C	B	C	B
ON	24V	0V	0V	0.7V	0.2V	0.8V
OFF	0V	0.7V	24V	0V	5.4V	0V

SW \ Tr.	Q212		Q213	
RADIO:	C	B	C	B
ON	24V	0V	0V	0.7V
OFF	0V	0.7V	24V	0V

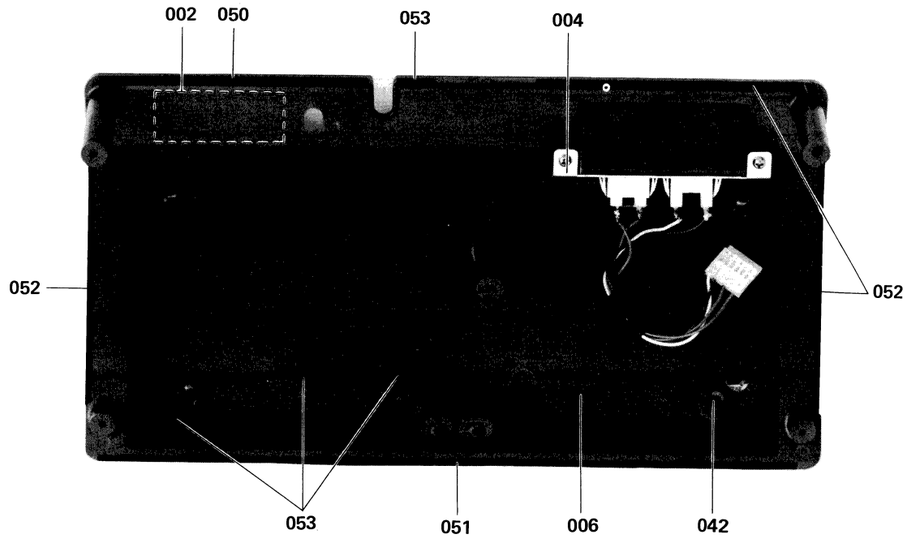
SW \ Tr.	Q214		Q215	
—	C	B	C	B
TIMER: ON	0V	0.7V	24V	0V
CLOCK: ON	24V	0V	0V	0.7V

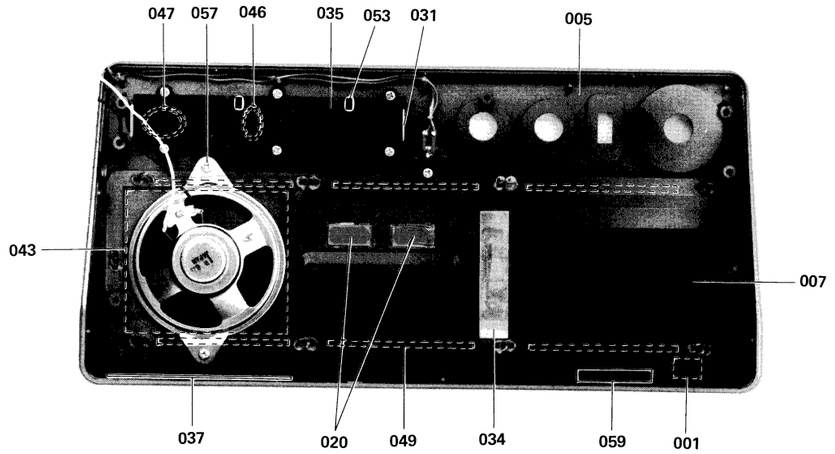
Tr. \	Q208		
—	E	C	B
Q205:ON,Q206:OFF	24V	24V	22V
OTHER	0V	24or0V	0V

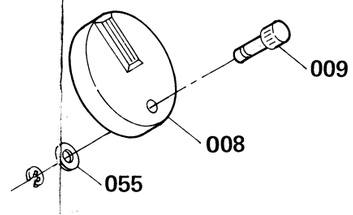
Tr. \	Q211		
—	E	C	B
Q205:ON,Q210:OFF	0V	0V	0.7V
OTHER	0V	0or24V	0V

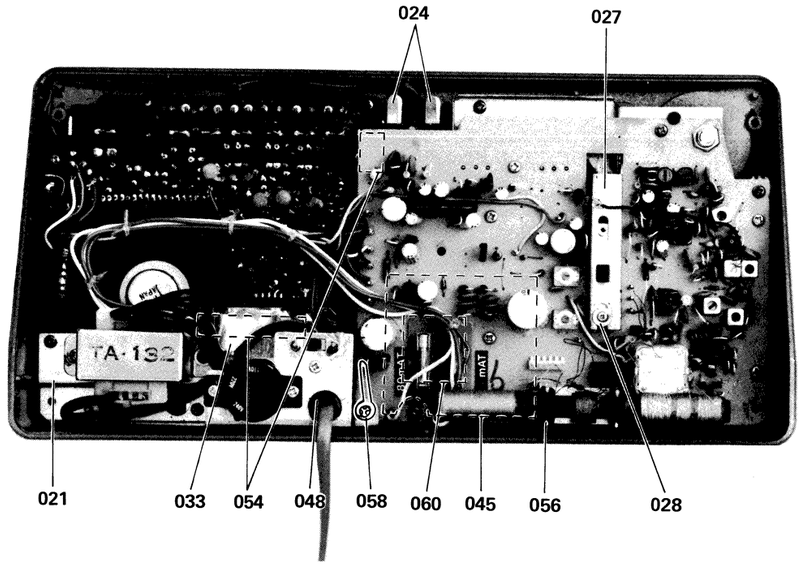
(Specifications or wiring diagrams of this model are subject to change for the improvement without prior notice.)

Figure 19 SCHEMATIC DIAGRAM (CLOCK SECTION)









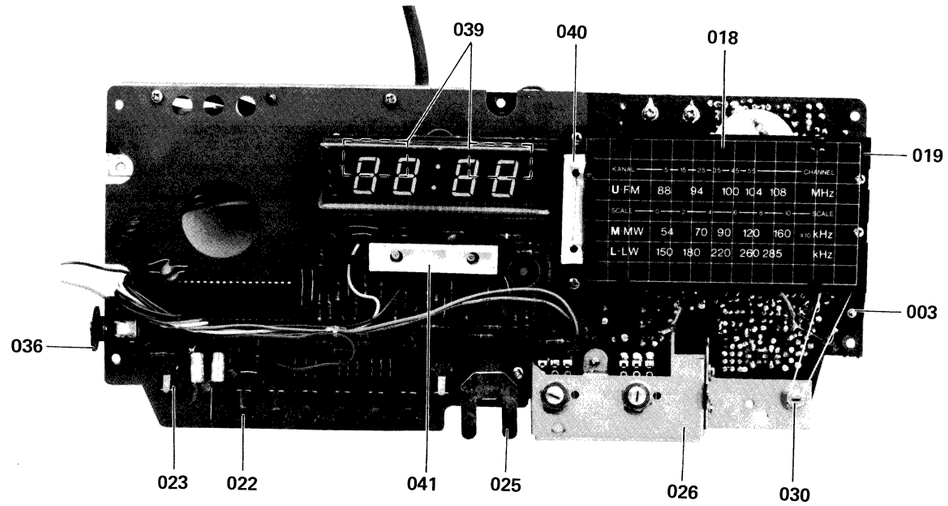


Figure 20 MISCELLANEOUS PARTS GUIDE

REPLACEMENT PARTS LIST

"HOW TO ORDER REPLACEMENT PARTS"

To have your order filled promptly and correctly, please furnish the following informations.

1. MODEL NUMBER
2. REF. NO.
3. PART NO.
4. DESCRIPTION

REF. NO.	PART NO.	DESCRIPTION	CODE
		IC (Integrated Circuit)	
IC101	91TTA7207	Power Amp. (TA7207)	
IC201	RH-IX1016AFZZ	Clock LS1 (MM5316)	
		TRANSISTORS	
Q101	91T2SC784(O)	FM RF Amp. (2SC784 O)	
Q102	91T2SC785(O)	FM Convertor (2SC785 O)	
Q103	91T2SC380(O)	FM/AM 1st IF Amp. (2SC380 O)	
Q104	91T2SC380(O)	FM/AM 2nd IF Amp. (2SC380 O)	
Q105	91T2SC380(O)	FM/AM 3rd IF Amp. (2SC380 O)	
Q106	91T2SC1815(Y)	AM Convertor (2SC1815 Y)	
Q107	91T2SC1815GR	Tuning Indicator Drive (2SC1815GR)	
Q108	91T2SC1815(O)	Alarm Oscillator (2SC1815 O)	
Q109	91T2SC496(Y)	Power Supply (2SC496 Y)	
Q110	91T2SC735(O)	Power Supply (2SC735 O)	
Q111	91T2SC1815(O)	Power Supply (2SC1815 O)	
Q201	VHPPT-350//-1	e.b.e. (electronic brightness eye), (PT350)	
Q202	91T2SA562(Y)	Dial Lamp Drive (2SA562 Y)	
Q203	91T2SC1815(Y)	e.b.e. Drive (2SC1815 Y)	
Q204	91T2SA495(Y)	Timer Colon Indicator (2SA495 Y)	
Q205	91T2SC1815(Y)	ALARM OUT Switching (2SC1815 Y)	
Q206, Q207, Q208	91T2SC1815(Y)	ALARM Switching (2SC1815 Y)	
Q209, Q210, Q211	91T2SC1815(Y)	AUTO Switching (2SC1815 Y)	
Q212, Q213	91T2SC1815(Y)	ON (RADIO) Switching (2SC1815 Y)	
Q214, Q215	91T2SC1815(Y)	CLOCK/TIMER Switching (2SC1815 Y)	
Q216	91T2SC1815(Y)	ALARM Lamp Drive (2SC1815 Y)	
Q217	91T2SC1815(Y)	RADIO Lamp Drive (2SC1815 Y)	
		DIODES	
D1	VHPGL31AR//-1	L.E.D. Tuning Indicator (GL31AR)	
D101	91T1S-553	FM AFC (1S553)	
D102	91T1S188FM	FM Discriminator (1S188FM)	
D103	91T1S188FM	FM Discriminator (1S188FM)	
D104	91T1S188AM	AM Detector (1S188AM)	
D105	91T1S188AM	AM Detector (1S188AM)	
D106	91T1S-1555	AM Overload (1S1555)	
D107, D108, D109, D110	91TSR1K-2	Rectifier (SR1K-2)	
D111	91T02Z6.8A	Zener, Voltage Regulator (02Z6.8A)	
D112	91T05Z24A	Zener, Voltage Regulator (05Z24A)	
D113	91T02Z7.5A	Zener, Voltage Regulator (02Z7.5A)	
D114	91TSR1K-2	Rectifier (SR1K-2)	
D115	91T1S-1555	FM Overload (1S1555)	
D116	91T1S-1555	FM Overload (1S1555)	
D201, D202, D203, D204, D205	91T1S-1555	Protector, Reverse Current (1S1555)	
D206, D207, D208, D209, D210, D211, D212, D213, D214, D215, D216	91T1S-1555	Switching, Function Selector (1S1555)	
D217	91T1S-1555	Protector, Reverse Current (1S1555)	
		COILS	
L101	91THA-018	FM Antenna	
L102	91THB-060	FM RF	
L103	91THB-059	FM RF	
L104 (A, B)	91THC-060	FM Oscillator	
L105	91THE-041	FM Emitter Choke	
L106	91TAD-134	MW/LW Bar Antenna	
L107	91THN-008	AM Oscillator	
L108	91THA-008	FM Antenna	
		TRANSFORMERS	
T1	91TTA-132	Power	
T101	91TIL-007	FM 1st IF	

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
T102	91TIL-007	FM 2nd IF	
T103	91TIL-007	FM 3rd IF	
T104	91TIP-007	FM Discriminator	
T105	91TIP-008	FM Discriminator	
T106	91TID-010	AM 1st IF	
T107	91TIE-009	AM 2nd IF	
T108	91TIF-011	AM Detector	
		CONTROLS	
VC101, VC102, VC103, VC106, TC101, TC102, TC103, TC106	91TCW-023	Variable Capacitor with Trimmers TC101: FM Antenna Trimmer TC102: FM Oscillation Trimmer TC103: MW Antenna Trimmer TC106: MW Oscillation Trimmer	
TC104	91TCT-044	LW Antenna Trimmer	
TC105	91TCT-044	LW Oscillation Trimmer	
VR101	91TRW-100	50K ohm (A), Volume	
VR102	91TRW-100	50K ohm (A), Tone	
		ELECTROLYTIC CAPACITORS	
C131	91TCDV0.47/10A	.47MFD, 10V, +75 –10%	
C132	91TCDV4.7/10Q	4.7MFD, 10V, +100 –10%	
C139	91TCDV10/10Q	10MFD, 10V, +100 –10%	
C140	91TCDV4.7/10A	4.7MFD, 10V, +75 –10%	
C152	91TCDV4.7/10A	4.7MFD, 10V, +75 –10%	
C155	91TCDV47/10Q	47MFD, 10V, +100 –10%	
C156	91TCDV10/10Q	10MFD, 10V, +100 –10%	
C159	91TCDV47/10Q	47MFD, 10V, +100 –10%	
C160	91TCDV220/10Q	220MFD, 10V, +100 –10%	
C161	91TCDV4.7/10A	4.7MFD, 10V, +75 –10%	
C162	91TCDV1/25A	1MFD, 25V, +75 –10%	
C166	91TCDV220/10Q	220MFD, 10V, +100 –10%	
C167	91TCDV33/25Q	33MFD, 25V, +100 –10%	
C168	91TCDV47/10Q	47MFD, 10V, +100 –10%	
C169	91TCDV220/35Q	220MFD, 35V, +100 –10%	
C170	91TCDV1000/16Q	1000MFD, 16V, +100 –10%	
C176	91TCDV4.7/10A	4.7MFD, 10V, +75 –10%	
C178	91TCDV1/25A	1MFD, 25V, +75 –10%	
C201	91TCDV4.7/25A	4.7MFD, 25V, +75 –10%	
C203	91TCDV1/25A	1MFD, 25V, +75 –10%	
		CAPACITORS (Unless otherwise specified capacitors are +80 –20%, 50V, Ceramic type.)	
C101	91TCC-120K	12PF, 50V, ±10%, Ceramic	
C102, C103	91TCC-050C	5PF, 50V, ±.25PF, Ceramic	
C104, C105, C106	91TCK-222Z	.0022MFD	
C107	91TCK-103Z	.01MFD	
C108	91TCC-681K	680PF, 50V, ±10%, Ceramic	
C109	91TCC-180K	18PF, 50V, ±10%, Ceramic	
C110	91TCC-040C	4PF, 50V, ±.25PF, Ceramic	
C111	91TCC-330K	33PF, 50V, ±10%, Ceramic	
C112	91TCC-040C	4PF, 50V, ±.25PF, Ceramic	
C113	91TCK-222Z	.0022MFD	
C114	91TCC-150K	15PF, 50V, ±10%, Ceramic	
C115	91TCK-103B	.01MFD, 50V, ±.1%, Ceramic	
C116	91TCC-050K	5PF, 50V, ±10%, Ceramic	
C117	91TCK-103Z	.01MFD	
C118, C119	91TCC-005C	.5PF, 50V, ±.25PF, Ceramic	
C120	91TCK-203Z	.02MFD	
C121	91TCK-103Z	.01MFD	
C122	91TCC-010C	1PF, 50V, ±.25PF, Ceramic	
C123	91TCC-005C	.5PF, 50V, ±.25PF, Ceramic	
C124	91TCK-203Z	.02MFD	
C125, C126	91TCK-103Z	.01MFD	
C127	91TCC-010C	1PF, 50V, ±.25PF, Ceramic	
C128	91TCK-103Z	.01MFD	
C129	91TCMS-102M	.001MFD, 50V, ±20%, Mylar	
C130	91TCMS-103M	.01MFD, 50V, ±20%, Mylar	
C133, C134	91TCC-331K	330PF, 50V, ±10%, Ceramic	
C135, C136	91TCK-203Z	.02MFD	
C137	91TCMS-103M	.01MFD, 50V, ±20%, Mylar	
C138	91TCK-203Z	.02MFD	
C141, C142, C143, C144, C145, C146	91TCK-203Z	.02MFD	
C147	91TCC-101K	100PF, 50V, ±10%, Ceramic	
C148	91TCC-150K	15PF, 50V, ±10%, Ceramic	
C149	91TCMS-183K	.018MFD, 50V, ±10%, Mylar	
C150	91TCK-203Z	.02MFD	
C151	91TCK-103Z	.01MFD	
C153	91TCMS-183K	.018MFD, 50V, ±10%, Mylar	
C154	91TCK-472K	.0047MFD, 50V, ±10%, Ceramic	
C157	91TCC-681K	680PF, 50V, ±10%, Ceramic	
C158	91TCMS-183K	.018MFD, 50V, ±10%, Mylar	
C163, C164, C165	91TCK-472K	.0047MFD, 50V, ±10%, Ceramic	
C171	91TCK-103Z	.01MFD	
C172, C173, C174, C175	91TCK-203Z	.02MFD	
C177	91TCK-223B	.022MFD, 50V, ±.1%, Ceramic	
C202	91TCMS-103K	.01MFD, 50V, ±10%, Mylar	
C204, C205, C206, C207, C208, C209, C210, C211	91TCK-103P	.01MFD, 50V, +100 –0%, Ceramic	
C212, C213, C214, C215, C216, C217	91TCK-102P	.001MFD, 50V, +100 –0%, Ceramic	

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
C218, C219	91TCK-102P	.001MFD, 50V, +100 –0%, Ceramic	

RESISTORS

(Unless otherwise specified resistors are 1/4W, ±10%, Carbon type.)

R101	91TRD14PY1MK	1 Meg ohm	
R102, R103	91TRD14PY1KK	1K ohm	
R104	91TRD14PY1.5KK	1.5K ohm	
R105	91TRD14PY33K	33 ohm	
R106	91TRD14PY39KK	39K ohm	
R107	91TRD14PY12KK	12K ohm	
R108	91TRD14PY1KK	1K ohm	
R109	91TRD14PY180K	180 ohm	
R110	91TRD14PY100KK	100K ohm	
R111, R112	91TRD14PY680K	680 ohm	
R113	91TRD14PY12KK	12K ohm	
R114	91TRD14PY39KK	39K ohm	
R115	91TRD14PY680K	680 ohm	
R116, R117, R118	91TRD14PY1KK	1K ohm	
R119	91TRD14PY6.8KK	6.8K ohm	
R120	91TRD14PY15KK	15K ohm	
R121	91TRD14PY100KK	100K ohm	
R122	91TRD14PY1KK	1K ohm	
R123, R124	91TRD14PY6.8KK	6.8K ohm	
R125	91TRD14PY1KK	1K ohm	
R126	91TRD14PY8.2KK	8.2K ohm	
R127	91TRD14PY1.5KK	1.5K ohm	
R128	91TRD14PY56KK	56K ohm	
R129	91TRD14PY470K	470 ohm	
R130	91TRD14PY3.9K	3.9K ohm	
R131	91TRD14PY1KK	1K ohm	
R132	91TRD14PY27KK	27K ohm	
R133	91TRD14PY8.2KK	8.2K ohm	
R134	91TRD14PY33KK	33K ohm	
R135	91TRD14PY1.8KK	1.8K ohm	
R136	91TRD14PY470K	470 ohm	
R137	91TRD14PY2.2KK	2.2K ohm	
R138	91TRD14PY33KK	33K ohm	
R139, R140	91TRD14PY12KK	12K ohm	
R141	91TRD14PY4.7KK	4.7K ohm	
R142	91TRD14PY12KK	12K ohm	
R143	91TRD14PY33KK	33K ohm	
R144	91TRD14PY330K	330 ohm	
R145	91TRD14PY33KK	33K ohm	
R146	91TRD14PY3.3MK	3.3 Meg ohm	
R147, R148	91TRD14PY47KK	47K ohm	
R149	91TRD14PY2.2MK	2.2 Meg ohm	
R150	91TRD14PY47KK	47K ohm	
R151, R152	91TRD14PY1KK	1K ohm	
R153	91TRD14PY2.2KK	2.2K ohm	
R154	91TRD14PY1.5KK	1.5K ohm	
R155	91TRD14PY100KK	100K ohm	
R156	91TRD14PY10K	10 ohm	
R157	91TRD14PY12KK	12K ohm	
R158	91TRD12PY68K	68 ohm, 1/2W	
R159	91TRD14PY3.3KK	3.3K ohm	
R160	91TRD14PY15KK	15K ohm	
R161	91TRD14PY220K	220 ohm	
R162	91TRD14PY33K	33 ohm	
R163	91TRD14PY18KK	18K ohm	
R164	91TRD14PY10K	10 ohm	
R201	91TRD12PY100K	100 ohm, 1/2W	
R202	91TRD14PY330K	330 ohm	
R203	91TRD14PY2.2KK	2.2K ohm	
R204	91TRD14PY5.6KK	5.6K ohm	
R205	91TRD14PY3.9KK	3.9K ohm	
R206, R207	91TRD14PY33KK	33K ohm	
R208	91TRD14PY10KK	10K ohm	
R209	91TRD14PY33KK	33K ohm	
R210	91TRD14PY100KK	100K ohm	
R211	91TRD14PY10KK	10K ohm	
R212	91TRD14PY1.5KK	1.5K ohm	
R213	91TRD14PY10KK	10K ohm	
R214	91TRD14PY220KK	220K ohm	
R215	91TRD14PY33KK	33K ohm	
R216	91TRD14PY220KK	220K ohm	
R217, R219	91TRD14PY10KK	10K ohm	
R220, R221	91TRD14PY220KK	220K ohm	
R222	91TRD14PY10KK	10K ohm	
R223	91TRD14PY33KK	33K ohm	
R224, R225	91TRD14PY10KK	10K ohm	
R226, R227	91TRD14PY220KK	220K ohm	
R228, R229	91TRD14PY10KK	10K ohm	
R230	91TRD14PY100KK	100K ohm	
R231	91TRD14PY220KK	220K ohm	
R232	91TRD14PY6.8KK	6.8K ohm	
R233	91TRD14PY1KK	1K ohm	
R234	91TRD14PY220KK	220K ohm	

MISCELLANEOUS

F101	91TZF-047	Fuse, 400mAT	
F102	91TZF-044	Fuse, 80mAT	
J1	91TJK-010	Jack, Earphone	
P1	91TLA-014	Terminal	
PL201	91TBP-063	Lamp, Dial	
PL202	91TBP-076	Lamp, RADIO	
PL203	91TBP-076	Lamp, ALARM	
SP1	91TPJ-005	Speaker	
SO1	91TJI-006	Socket, FM Antenna	
SO2	91TJI-007	Socket, AM EXT. Antenna	
SW1	91TSQ-058	Switch, Voltage Selector	
SW2	91TSR-064	Switch, 50/60Hz Selector	
SW3 (A∼F)	91TSR-065	Switch, Band Selector	
	91T4-LT-16	Display Tube	
	91TJG-005	Holder, Fuse	
	91T7716BP10	P.W. Board, Radio/Dial Pointer	
	91T7716BP20	P.W. Board, Clock/e.b.e.	
	QACCB0052AF09	Mains Supply Cord, BS (91TZA-052)	

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	CODE
	QACCV0001AGZZ	Mains Supply Cord, KEMA (91TZA-050)	
	QACCZ0053AF00	Mains Supply Cord (91TZA-053)	
	91TPR-003	Earphone	
	91TJB-004	Plug, FM Antenna	
001	91T7716A01	Badge, SHARP Mark	
002	91T7716A02	Plate, Spec.	
003	91T7716A03	Bracket with Pulley, Dial Plate	
004	91T7716A04	Bracket, AM/FM ANT. Socket	
005	91T7716B01	Cabinet, Top	
006	91T7716B02	Cabinet, Bottom	
007	91T7716B03	Smoked Panel	
008	91T7716B04	Knob, Tuning	
009	91T7716B05	Knob, Tuning Handle	
010	91T7716B06	Knob, Band Selector	
011	91T7716B07	Knob, Volume/Tone	
012	91T7716B08	Knob, Alarm/Auto/⏻(OFF)/ Radio (ON)/Clock/Timer/ Sleep	
013	91T7716B09	Knob, Snooze	
014	91T7716B10	Knob, Timer Adjust (Slow/ Fast)	
015	91T7716B11	Cover, e.b.e.	
016	91T7716B12	Cover, RADIO	
017	91T7716B13	Cover, ALARM	
018	91T7716B14	Dial Scale	
019	91T7716B15	Bracket, Dial Scale	
020	91T7716B16	Tape (Red), RADIO/ALARM	
021	91T7716C01	Bracket, Power Transformer	
022	91T7716C02	Spring (Plate), Point of Con Contact A	
023	91T7716C03	Plating Wire, Point of Contact B	
024	91T7716C04	Spring (Plate), Point of Contact C	
025	91T7716C05	Spring (Plate), Point of Contact D	
026	91T7716C06	Bracket, Volume/Tone	
027	91T7716C07	Lever, Band Selector Switch	
028	91T7716C08	Spacer, Band Selector Lever	
029	91T7716C09	Guide, Dial Pointer	
030	91T7716C10	Shaft, Dial Cord	
031	91T7716C11	Spring,(Plate), Push Switch	
032	91T7716C12	Spring, Dial Cord	
033	91T7716C13	Shield, Clock P.W. Board	
034	91T7716C14	Plate, Reflector (Dial Lamp)	
035	91T7716D01	Guide, Push Switch Knob	
036	91T7716D02	Rubber Washer, Earphone Jack	
037	91T7716D03	Felt, Cabinet Top	
038	91T7716D04	Felt, Dial Pointer	
039	91T7716D05	Cushion, Display Tube	
040	91T7716D06	Holder, Dial Lamp	
041	91T7716D07	Holder, RADIO/ALARM Lamp	
042	91T7716D08	Leg	
043	91T7716D09	Felt, Speaker	
044	NDRM-0061AFZZ	Drum, Dial Cord (91T7716D10)	
045	91T7716D11	Insulator, RADIO P.W. Board	
046	91T7716D12	Felt, Push Switch Knob (without Snooze)	
047	91T7716D13	Felt, Push Switch Knob (Snooze)	
048	91T7716D14	Bushing, Mains Supply Cord	
049	91T7716D15	Felt, Top/Bottom Cabinet (65 x 2.5mm)	
050	91T7716D16	Felt, Bottom Cabinet (110 x 3mm)	
051	91T7716D17	Felt, Bottom Cabinet (290 x 3mm)	
052	91T7716D18	Felt, Bottom Cabinet (130 x 3mm)	
053	91T7716D19	Felt, Bottom Cabinet (15 x 3mm)	
054	91T7716D20	Cushion, Shield	
055	91T7716D21	Felt, Tuning Handle	
056	91T1222C09	Holder, Bar Antenna	
057	91T1218C06	Bracket, Speaker Retaining	
058	91T1221C03	Holder, Wire	
059	91T7631D10	Cushion, Top Cabinet	
060	91T7653D08	Spacer, Insulator	
	91T7716F01	Packing Case	
	91T7716F02	Cushion (Left)	
	91T7716F03	Cushion (Right)	
	91T7716F05	Sack, Unit	

A7712-4.8MNK
Printed in Japan